

WST2

Washington State Technology Transfer



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Bicyclists and Pedestrians

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Remote Imaging of Culverts and Down-Holes

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**Washington State
Department of Transportation**

A Technical Digest of the
Washington State Department of Transportation (WSDOT)
and the Local Technical Assistance Program (LTAP)

Issue 85, Winter 2005

Washington State Technology Transfer

WST2 Washington State Technology Transfer

is published quarterly without fee

by WSDOT Highways & Local Programs
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Requests for subscriptions, change of address, and other subscriber services should be addressed to schmidw@wsdot.wa.gov, or phone (360) 705-7386, or WST2 Center, PO Box 47390, Olympia, WA 98504-7390. Subscriptions are distributed free of charge.

Issue 85, Winter 2005

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Article contributions, questions, or comments are welcome.
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Editor reserves the right to refuse to publish and to edit articles
to conform to the standards of our publication.

The opinions expressed in articles are not necessarily those
of the editor.

Cover photo: *This photo is the inside view of a
video surveillance cabinet.*

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From the Editor's Desk

Every once in a great while, a catastrophic and tragic event occurs that garners the engineering and scientific community's attention because it seems that technology transfer may have prevented some of the destruction, loss of life, and disruption to the lives of entire regions. I'm speaking about the devastating tsunami that struck South Asia the day after Christmas 2004. My heartfelt condolences go out to all those affected by this event. I see a ray of hope that the world can pull together, show compassion, and give assistance following this event that ultimately affected many more countries not geographically related to the Indian Ocean and the Bay of Bengal. I hope that the money and transfer of technology will enable more parts of the world to have tsunami warning systems placed because no area of the oceans' coastlines are immune to earthquake-generated ocean waves.

The idea of monitoring undersea events that breed tsunamis gained public support in the mid 40s. The technology to give reliable warnings became commonplace as a result of applications near Japan. The Japanese word Tsunami (pronounced Soo-Nah-mee) means "Port Wave." Many tsunamis have struck the Japanese island chain, causing deaths and destruction over the course of the last 200 years.

Currently, most Pacific Rim nations are warned of tsunamis by a simple system of buoys. The U.S. monitors many of these buoys from emergency centers located in Hawaii and Alaska. Experts tell us that the system is not difficult or expensive to install. The U.S. has had a monitoring system in place for more than 50 years, consisting of about 50 seismometers strategically placed across the Northwest on the Pacific Ocean surface and below to detect and measure undersea earthquakes and subsequent ocean behavior. In addition, out in the middle of the Pacific Ocean are six buoys appropriately named "tsunameters" that measure changes in water pressure and are programmed to uplink to a satellite and notify the USA's two tsunami-warning centers in Hawaii and Alaska when certain pressure changes are detected in ocean movements. The tsunameters each cost \$250,000.

The Japanese invented the earliest devices in the last century, and the U.S. improved upon the technology. I hope that the knowledge gained from this last tsunami will effectively result in installations in the Indian Ocean (with possible funding from the UN) and will ultimately improve the technology already being used in the Pacific Ocean. Tsunamis are predictable and the next significant step for the U.S. will be the transfer of technology of "evacuation procedures." Education and training in coastal areas and evacuation transportation systems need to be set in place so a warning will be heeded. LTAP can help by offering training and giving technical assistance to the workforce that needs this information to maintain and improve our transportation system.

This issue of our LTAP (WST2) newsletter highlights a sampling of in-depth technical reviews that have been featured in the Washington State DOT "Measures, Markers and Mileposts," the *Gray Notebook*. This innovative publication, introduced by Secretary of Transportation Doug MacDonald to the agency when he arrived in 2001, is a quarterly publication that communicates WSDOT business and in-depth reviews of agency and transportation system performance. I think you will find this small sampling of reviews interesting and informative, showing the strength behind managing what is measurable.

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The Local Technical Assistance Program (LTAP) is a national program financed by the Federal Highway Administration (FHWA) and individual state transportation departments. Administered through Technology Transfer (T2) Centers in each state, LTAP bridges the gap between research and practice by translating state-of-the-art technology into practical application for use by local agency transportation personnel.

Any opinions, findings, conclusions, or recommendations presented in this newsletter are those of the authors and do not necessarily reflect the views of WSDOT or FHWA. All references to proprietary items in this publication are not endorsements of any company or product.



Washington State
Department of Transportation



U. S. Department of Transportation
Federal Highway Administration

Pacific Northwest Bridge Maintenance Conference

The Pacific Northwest Bridge Maintenance Conference was held November 3-4, 2004, at the Holiday Inn Portland Airport Hotel & Trade Center in Portland, Oregon. The Washington, Oregon, Idaho, and Alaska Departments of Transportation and the Federal Highway Administration sponsored the biennial event. The conference attracted 350 individuals from up and down the west coast and also garnered some national attendance. Interest and attendance has grown with each successive presentation since the launch in the year 2000.

The conference is not only proving to be a hit with bridge maintenance professionals but also with the wide spectrum of product exhibitors specializing in products designed to extend the life of bridges. There is great excitement among the participants that there is a forum providing such excellent opportunities for various bridge maintenance crews to share information, innovation, and creative ideas. While some speakers are invited to provide a national perspective to common bridge problems, the vast majority of speakers are members of bridge maintenance crews. These speakers often beg forgiveness for their lack of experience making formal presentations in front of such a large group but their presentations are invariably informative and well done. Two awards are presented to speakers at the conclusion of the conference. One, the Most Innovative Method Award, rewards the most unique idea and is voted on by all conference participants. The second is the Executive Award, which is voted on by the conference steering committee.

The 2004 winner for the Most Innovative Method Award was Martin Harding from Linn County, Oregon. Martin presented a repair method that involves using a hydraulic jack to drive an auxiliary steel pile beside a deteriorated wooden pile. The Linn County Bridge Crew developed an adjustable sleeve so greater lengths of steel pile could be "driven" before splicing was required.



Open sessions provide information targeted for all participants.



Martin Harding (left) receiving the Most Innovative Method Award from ODOT's Gary Bowling.

The Executive Award was given to Dave McGirr of Oregon DOT's Pendleton bridge crew. Dave was a last-minute replacement to present an innovative and efficient method of Epoxy Injection of Cracked Concrete Members. Dave's presentation was a follow-up to a presentation done during the 2002 Pacific Northwest Bridge Maintenance Conference. He outlined some improved methods and custom equipment that have evolved in the intervening years.


The next Pacific Northwest Bridge Maintenance Conference is already being planned for the fall of 2006. Those interested are encouraged to develop presentation ideas. Those who have presented information at past conferences are also encouraged to present a follow-up presentation outlining improvements and refinements to their procedures. Keep an eye on the official website maintained by Washington State University Conferences and Professional Programs at <http://www.capps.wsu.edu/bridge/#Bridge>. There you will be able to view information about the 2004 conference and get the latest information on the next conference as it becomes available.



Breakout sessions allow attendees to choose subjects that interest them most.



Dave McGirr (left) receiving the Executive Award from ODOT's Gary Bowling.

 About the Conference Every two years, the Pacific Northwest Bridge Maintenance Conference provides a forum for the various bridge maintenance crews, located throughout each of the Pacific Northwest states, to share information, innovations, creative ideas, and tricks of the trade.									
Preliminary Conference Program Wednesday, November 3, 2004									
7:00 am	Registration opens								
8:00 am - 8:15 am	Welcome, Cathy Nelson Introductions, Archie Allen, Gary Bowling, and Barry Bre...								
8:15 am - 10:00 am	National Initiatives for Highway Infrastructure Security Army Corp of Engineers, and Steve Ernst, Federal High...								
10:00 am - 10:30 am	Break								
10:30 am - Noon	Session 1 @breakouts								
<table border="1"> <thead> <tr> <th>Concrete Repair</th><th>Steel</th></tr> </thead> <tbody> <tr> <td>Underwater Pile Repair, Rich Smith, ODOT</td><td>Steel Repair, Steve Ernst, ODOT</td></tr> <tr> <td>Bridge Deckwork Repair using the Fast Break technique, WSDOT</td><td>Steel Repair, Steve Ernst, ODOT</td></tr> <tr> <td>Bridge Expansion Joints Repair using the Fast Break technique, WSDOT</td><td>Steel Repair, Steve Ernst, ODOT</td></tr> </tbody> </table>		Concrete Repair	Steel	Underwater Pile Repair, Rich Smith, ODOT	Steel Repair, Steve Ernst, ODOT	Bridge Deckwork Repair using the Fast Break technique, WSDOT	Steel Repair, Steve Ernst, ODOT	Bridge Expansion Joints Repair using the Fast Break technique, WSDOT	Steel Repair, Steve Ernst, ODOT
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Noon - 1:30 pm	Lunch								
1:30 pm - 3:00 pm	Session 2 @breakouts								
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Under Pile Cap Replacement Using the Fast Break technique, WSDOT	Steel Repair, Steve Ernst, ODOT								

Thursday, November 4, 2004	
8:00 am - 8:30 am	Bridge Maintenance and Test Risk, Rob Shepherd, ODOT
8:30 am - 9:00 am	Assessment of Damaged Cracked Reinforced Concrete Deck Girders, Christopher Higgins, Oregon State University
9:00 am - 10:00 am	New and Innovative Bridge Maintenance in the Northwest States, Peter Waples, Bridge Maintenance Manager, Chairman of the Bridge Task Force, AASHTO Subcommittee on Maintenance, New York DOT
10:00 am - 10:30 am	Break
10:30 am - 11:15 am	Bridge Maintenance in Environmental Mitigation and the BMPs used to Avoid and Minimize Impacts, Tom Stephens, WSDOT
11:15 am - 11:30 am	NW Region Security, Archie Allen, WSDOT NW Region
11:30 am - 11:45 am	America's Watoway Watch, Steven Craig, US Coast Guard
11:45 am - Noon	Conference Adjourns

Conference Information - <http://www.capps.wsu.edu/bridge/#Bridge>

Achieving the Promise of Ultra-High-Performance Concrete

Stronger, more durable bridges and faster construction. These benefits and more can result from the next generation of high-performance concrete (HPC), known as ultra-high-performance concrete (UHPC). UHPC, which has been used in two highway bridges in France and three pedestrian bridges in Canada, South Korea, and Japan, is now starting to gain attention in the United States. For the last 2 years, the Federal Highway Administration's (FHWA) Turner-Fairbank Highway Research Center (TFHRC) in McLean, Virginia, has been testing the viability of this new technology and assisting States willing to experiment with UHPC for use in bridges. Iowa is now constructing a bridge with UHPC components, and Virginia is using UHPC in bridge construction as well.

"UHPC is more durable, and it should last longer on a highway. You want a bridge to last at least 75 to 100 years, and that's hard to do," says Benjamin Graybeal of PSI, Inc., a contractor for FHWA. UHPC has more strength than HPC, while requiring less concrete, resulting in slimmer bridge designs and smaller amounts needed of other materials. In one test at TFHRC, for example, the strength of the UHPC allowed bridge girders to be designed and built with less material. Another benefit is that precast bridge elements built with UHPC are lighter and easier to transport to the job site and can be put into place faster during bridge



A composite bridge deck/girder combination made with ultra-high-performance concrete is installed for testing at FHWA's Turner-Fairbank Highway Research Center in McLean, Virginia.

construction, saving time and reducing labor costs.

UHPC is comprised of 2 percent steel fibers, notes Dean Bierwagen of the Iowa Department of Transportation. Steel fibers measuring 0.2 mm (.008 in) in diameter and 12.7 mm (0.5 in) in length are added to the concrete, which increases the tensile strength. The material is very dense and low in permeability, making it difficult for water to penetrate and resulting in less corrosion to embedded steel.

UHPC lacks the coarse aggregate found in HPC, says Vic Perry of Lafarge North America, which is the only company currently offering the material in the United States. Unlike HPC, UHPC consists of fine particles of sand, ground quartz, cement, and silica fume, plus a fiber matrix. Placing UHPC is similar to working with normal concrete, except that more care

must be taken to ensure that the dispersion of the steel fibers is not disrupted during placement. Once the UHPC is set, it may be cured with a steam treatment to speed the realization of its full strength and durability. The steam treatment, which takes about 48 hours, should not begin until at least 24 to 48 hours after casting.



FHWA exposed UHPC to a battery of tests to demonstrate its various qualities compared to regular concrete. The UHPC showed a compression strength of 28,000 psi, compared with 4,000 psi for normal concrete, while tensile cracking strength was above 1,000 psi, compared with 400 psi for normal concrete. In testing for resistance to road salts and chlorides, UHPC withstood these chemicals at a rate 100 times greater than normal concrete. UHPC also showed minimal degradation after being frozen and thawed more than 600 times. This is about double the number of cycles regular concrete is tested for freezing and thawing, notes Graybeal. The testing also revealed that UHPC worked best in girders

and decks, mainly because those pieces could be made lighter and slimmer with less concrete.

Compared to regular concrete, a cubic yard of UHPC can cost as much as 10 times more. However, depending on the project, the increased cost can be offset by reductions in the amount of materials needed and the time needed to complete the project. "Each project must be analyzed separately when considering the use of UHPC," says Graybeal.

To educate highway agencies and others about UHPC, Graybeal has made presentations on FHWA's research at several conferences, including the Precast/Prestressed Concrete Institute's 2004 National

Bridge Conference and this year's Concrete Bridge Conference, which was sponsored by the National Concrete Bridge Council, American Concrete Institute, and FHWA. He is also serving as an advisor to States considering using the new material.

Wapello County, Iowa, is constructing one of the first UHPC bridges in the United States with support from FHWA's Innovative Bridge Research and Construction Program. The prestressed bridge is 33 m (110 ft) long. Due to the strength of the material, the bridge design has been changed from a three span, four beam cross section to a single span, three beam cross section, says Brian Moore,

Wapello County engineer. Once construction is completed, Iowa State University will monitor the performance of the new bridge.

For more information about UHPC, contact Benjamin Graybeal at 202-493-3122 (e-mail: benjamin.graybeal@fhwa.dot.gov), or Dean Bierwagen at 515-239-1585 (e-mail: dean.bierwagen@dot.iowa.gov). To learn more about the Wapello County project, contact Brian Moore at (641) 684-5425.

▲
Reprinted from the Federal Highway Administration's November 2004 Focus, which is also available at www.tfhrc.gov/focus/focus.htm

Retired Professionals: Ready to Work for You

Need help with a special project? Need the skills and experience of a public works professional? The Washington State Department of Transportation Highways & Local Programs' WST2 Center's database of Retired Professionals may be just what you need. It is a skills bank of professionals with expertise in maintenance, operations, engineering, inspection, construction, and surveying, just to name a few. You can browse through the listings from the T2 home page:

<http://www.wsdot.wa.gov/TA/T2Center/T2hp.htm>
Click on Retired Professional Program

We would like to increase the awareness of this program. We encourage you to tell your staff and soon-to-be-retired employees about this program. We would like to see this skills bank grow and become a strong, extensive, and useful resource for agencies when there is a need for outside professional help.

Are you retiring soon? Want to continue with part-time, full-time, or occasional employment? You can now enter your résumé directly online by going to:

http://fmapps.wsdot.wa.gov/retired_professional_reviewer

Enter all of your information and give yourself a Retiree Identifier that will allow you, and only you, to return at another time to make changes to your record. Then, click the register button. A window will pop up asking for a User ID and Password. You should enter:

User ID: retired

Password: kindof

This will be the only time you enter the User ID and Password.

Your résumé will be sent to Laurel Gray for review and posting to the web. If you prefer, you can access the first website above for a hard copy of the form to send to the WST2 Center.

If you have questions, contact Laurel Gray at (360) 705-7355 or GrayL@wsdot.wa.gov.

Meeting Work Zone Safety Requirements for Bicyclists and Pedestrians

"The needs and control of all road users through a work zone shall be an essential part of the highway construction, utility work, maintenance operations and the management of traffic incidents." – MUTCD Sect. 6D

State and federal regulations require a greater degree of attention and accommodation within work zones or temporary traffic control zones. Planning and accommodation for bicyclists and pedestrians — including people with disabilities — is as important as accommodation for motorists from the smallest project to the largest.

The regulations specify three general rules when planning for pedestrians:

- Pedestrians should not be led into conflicts with work site vehicles, equipment, and operations.
- Pedestrians should not be led into conflicts with vehicles moving through or around the worksite.
- Pedestrians should be provided with a reasonably safe, convenient, and accessible path that replicates as nearly as practical the existing sidewalk(s).

It is important to maintain connections to transit stops and crossings. Closing a sidewalk for construction and rerouting pedestrians to the other side of the street should only be done as a last resort when parking lanes are not available and it is not possible to temporarily close a travel lane to provide a continuous pedestrian path. Additional road crossings put pedestrians at greater risk.



Major arterial improvement.



Neighborhood collector improvement.

Walkways must be clearly identified (plastic tape is not adequate) and accessible, protected from motor vehicle traffic, and free from pedestrian hazards such as holes, debris, abrupt changes in grade or terrain, dust, and mud. A width of 1.5 meters (5 feet) is desirable for pedestrian walkways through or past work zones.

Construction traffic control signs should not be placed where they would block or protrude into wheelchair access along sidewalks. Sidewalks should not be used to store construction equipment, vehicles, signs, barricades, or cones.

Construction work zones should be inspected daily and monitored to ensure both vehicle and pedestrian safety. Information about construction zones that affect pedestrian facilities must be provided in as many ways and formats as possible.

For additional information and resources related to accommodating all modes in and around construction work zones, see Part VI of the *Manual for Uniform Traffic Control Devices* (MUTCD) and AASHTO's *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. WSDOT's Highways and Local Programs Division also offers training on this topic.

For information, contact the Bicycle and Pedestrian Program at (360) 705-7302.



Small Cities Traffic Services Outreach

Restructuring within the Highways & Local Programs Traffic Services branch has allowed an expanded focus on supporting smaller agency traffic engineering at agencies with populations under 10,000. This expanded focus is taking the form of a city outreach program designed to improve traffic services for these agencies.

Under normal circumstances, agency requests to the Traffic Services branch have limited the amount of outreach that was possible. Now, with an additional position supporting this outreach

effort, a proactive program to initiate contact with cities has been started. This proactive approach will provide services to agencies with traffic needs, and should reach agencies that might not have known these services were available.

The traffic services being offered include anything related to traffic issues. Examples of this would include: signing, striping, school zones, traffic analysis, safety analysis, traffic hardware/software, traffic signals, design issues, etc.

This outreach effort is starting with cities without any traffic engineering staff. As the program grows, it will reach out to many agencies across the state, offering traffic services to agencies that would otherwise have no access to traffic services. Other traffic engineering support will continue to be available to any local agency that has a need.

For information, contact Traffic Services at (360) 705-7385.



Washington's Transportation Plan Leads Agencies to Develop New Revenue Request

The Association of Washington Cities, the Association of Counties, the County Road Administration Board, the Transportation Improvement Board, Transit, and others are working closely with the Washington State Department of Transportation (WSDOT) to update the 20-year statewide transportation plan. This plan will address long- and short-range needs in nine primary issue areas including:

- preservation
- safety
- system efficiencies
- strong economy and good jobs
- bottlenecks and chokepoints (see system efficiencies)
- moving freight
- transportation access
- health and the environment, and
- future visions

In the first phase of the plan update, the Washington State Transportation Commission, which is the seven member board of directors for WSDOT, was briefed on the findings of an extensive data collection effort covering this comprehensive list of issue areas. Next, WSDOT will translate early findings into investment scenarios and work with the Transportation Commission to prioritize and finalize a proposal.

What Are We Finding?

Demand is growing, and the demand/capacity imbalance in the transportation system will continue to grow leading to more congestion. Congestion occurs mostly in the urban areas, especially Puget Sound, Vancouver, and Spokane.

Preservation

We have made progress in Washington. State pavements have improved, bridge rehabilitation has advanced, and inventories for most assets have been developed.

There are still large unfunded preservation needs:

State Highways

- Alaska Way Viaduct
- SR 520 Evergreen Point Floating Bridge
- state highway concrete pavements

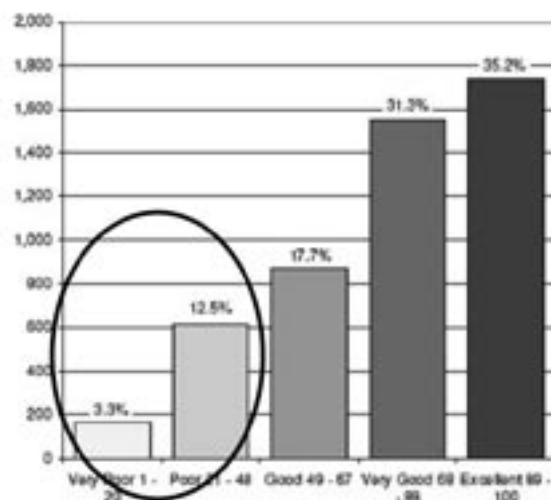
Local Roadways

- pavements and short span bridges

General Aviation

- airport pavements, and protection from land use encroachment

City Roadway Condition (Lane miles)



Safety

Fatalities are down, yet still too high. Six hundred people died in motor vehicle collisions in Washington in 2003. Motor vehicle collisions cost Washington \$5.6 billion per year.

Primary contributing factors are:

Rural Two-Lane Roads — While urban and rural roads have about the same number of fatalities, the fatality rate on rural roadways is almost twice that in urban areas. On rural two-lane roadways, the rate is even higher.

Cross-Over Protection — Head-on collisions continue to be an issue, especially in rural areas.

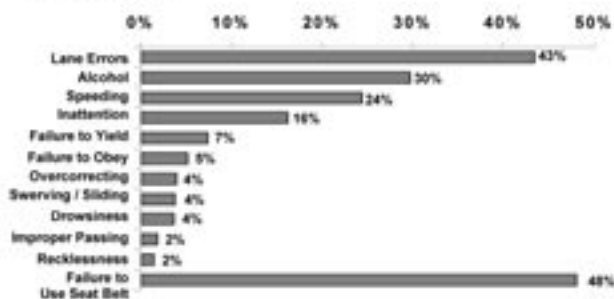
Speed — Excessive speed is a factor in 25 percent of fatal collisions.

Alcohol — Forty percent of fatalities involve impaired driving.

Age — Younger drivers have the highest fatality rate.

Seat Belts — Only 5 percent of drivers don't use seat belts, but they account for almost half of all fatalities.

Driver Errors and Behaviors Associated With Fatal Collisions in Washington State 1993 - 2001



System Efficiencies

Basic maintenance and operations are the cornerstone of keeping the system moving. As congestion grows, more sophisticated technologies along with improved public transit operations are needed to maintain traffic flow. WSDOT is considering a number of strategies including:

- ITS technologies
- Improved incident response
- HOV strategies

Strong Economy and Good Jobs

Washington's economy is shifting to become more services based, but manufacturing is still important.

Transportation is necessary for economic development, but not sufficient to ensure economic growth in specific locations.

Moving Freight

Focus on three areas:

1. Global Gateways

- **East/West** — Port access and rail capacity
- **North/South** — Border crossings and trucking growth

2. Washington's Manufacturers and Producers

- Regional economies and their transportation needs vary

3. Distribution of Goods

- Delivering the daily necessities to Washington residence represents 80 percent of the urban truck movement

Transportation Access

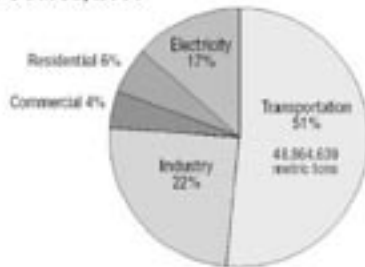
The growing elderly populations are driving longer, living past driving age, and have a growing suburban presence. There is a growing need for demand-response services like “Dial-a-Lift.”

Health and the Environment

Washington has made progress on air quality. New and growing concerns are emerging surrounding air toxics, diesel emissions, carbon dioxide emissions, and human health impacts.

WSDOT is working on getting a bigger return for mitigation investments. Specifically, WSDOT is focusing on watershed approaches that promise better outcomes, as well as storm water and habitat connectivity.

Carbon Dioxide (CO₂) Emissions in Washington State by Source, 2000



Future Visions

Rapidly evolving technology holds some nearer term promise:

New Fuels — non-petroleum energy sources, such as biodiesel and hydrogen, may improve air quality.

Smart Vehicles and Roads — interactive systems for variable cruise control and collision avoidance may improve efficiency and safety.

The Result: A Combined Proposal for New Revenue

The Washington State Transportation Commission met in Olympia on November 17, 2004 and January 18, 2005 to discuss future transportation funding proposals. In an effort to present a realistic and cohesive request for new revenue to the Legislature in 2005, the Commission invited city, county, and transit associations, as well as local funding boards to describe local transportation funding needs. Common desires among the transportation partners included enhancing freight mobility, improving safety, reducing congestion, and addressing deferred maintenance activities. Possible funding sources for these needs might include increases in the gas tax, weight fees, and/or license fees, or the application of a sales tax on gas. Further deliberation on potential transportation revenue scenarios and revenue distribution formulas will occur at upcoming Commission meetings.

For more information on the Washington Transportation Plan, go to <http://www.wsdot.wa.gov/planning/wtp>



Remote Imaging of Culverts and Down-Holes

Amit Armstrong, Ph.D., P.E., Technology Deployment Engineer; Bradley J. Roberts, Technology Deployment Systems Coordinator; Phone: (360) 619-7668; Fax: (360) 619-7846; E-mail: amit.armstrong@fhwa.dot.gov
Western Federal Lands Highway Division, Federal Highway Administration, Vancouver, Washington

Why?

During a typical highway design and construction process, the need to assess the condition of existing culverts, cross-drains, and under-drains was the primary reason for acquiring the Rovver® 600 robotic remote imaging tool. This assessment is especially important for the small diameter pipes located under high fills and retaining walls that cannot be inspected manually. Use of this tool has allowed our highway engineers to make “fact based” decisions in either replacing these pipes or accurately identifying the locations for rehabilitation using trenchless technologies. The geotechnical engineers have utilized the down-hole capabilities of this tool for verification of newly installed slope stability measuring devices as well as condition assessments of existing installations. The ability to position the camera into confined, normally inaccessible or unsafe areas allows our construction inspectors to verify structural reinforcement spacing, placing, and clearances for quality assurance and quality control purposes. The ability to push the camera into openings as small as two inches allows for the inspection of most in-place drainage systems and naturally occurring features. During the design process, the data collected once can be shared many times throughout the project life cycle with all of the primary stakeholders.

The Rovver® 600

The Rovver® 600, manufactured by Everest VIT, Inc., is a self-propelled, remotely operated motorized crawler. The versatile and modular component design provides the capability to inspect inside pipes with diameters ranging from 2- to 36-inches. The Rovver can be outfitted with either an axial camera head for down-hole and push pole applications or with a pan and tilt camera head using a fully articulating, manually focused, low-lux lens for larger pipes. Both these lenses will provide digital video and digital still images. The camera heads can operate independently of the Rovver crawler assembly. Both of these camera heads contain an embedded ring of LEDs around the perimeter of the lens to provide lighting.



The Rovver Applications

The Rovver was used to assess the condition of all major poured-in-place box culverts installed by the CCC in the 1930s at Alder Camp Road in the Redwood National Park in California. Ryan Tyler, Project Manager, Federal Highway Administration, realized benefits of using the Rovver:

“The ability to actively view the drainage structures on the Alder Camp affords us the ability to make ‘fact based’ decisions, which significantly mitigated the risk of our decisions. Our clients the National Park Service also took part in this effort which added support and buy-in for the hydraulic recommendations at these sites, and strengthened our overall team. Although the use of the Rovver increased PE costs, that amount is minute compared to the potential associated construction costs reflecting unknown conditions of in situ structures (in the case of Alder Camp Road).”

The use of the Rovver tremendously helped the project team in their overall hydraulic analysis and condition assessment of the existing structures in order to accurately determine the appropriate treatment/rehabilitation efforts required. Several box culverts did not require replacement as initially estimated resulting in significant cost savings.

The Rovver was also used to assess the condition of a 24-inch culvert on the Swamp Creek — East Project located near Libby, Montana. The inlet of the pipe was dry while the outlet was producing a steady stream of water. Richard B. Jackson, Geotechnical Engineer, Montana Department of Transportation was aware that the culvert was being fed by collector pipes that ran parallel to the highway; however, the exact location and number of collector pipes, as well as the overall condition of the entire spring collection

system was not apparent to Montana DOT engineers. After using the Rovver to collect data, Richard Jackson stated:

"The information provided by the robotic camera will be invaluable in the design of the roadway embankment and culvert. A decision has to be made as to whether we extend the existing culvert or build a new culvert and spring collection system. It is estimated that the information obtained by the robotic camera has a 'value added' of up to \$100,000. This 'value added' is derived from being able to better design the culvert which will help avoid costly change orders and claims during construction."

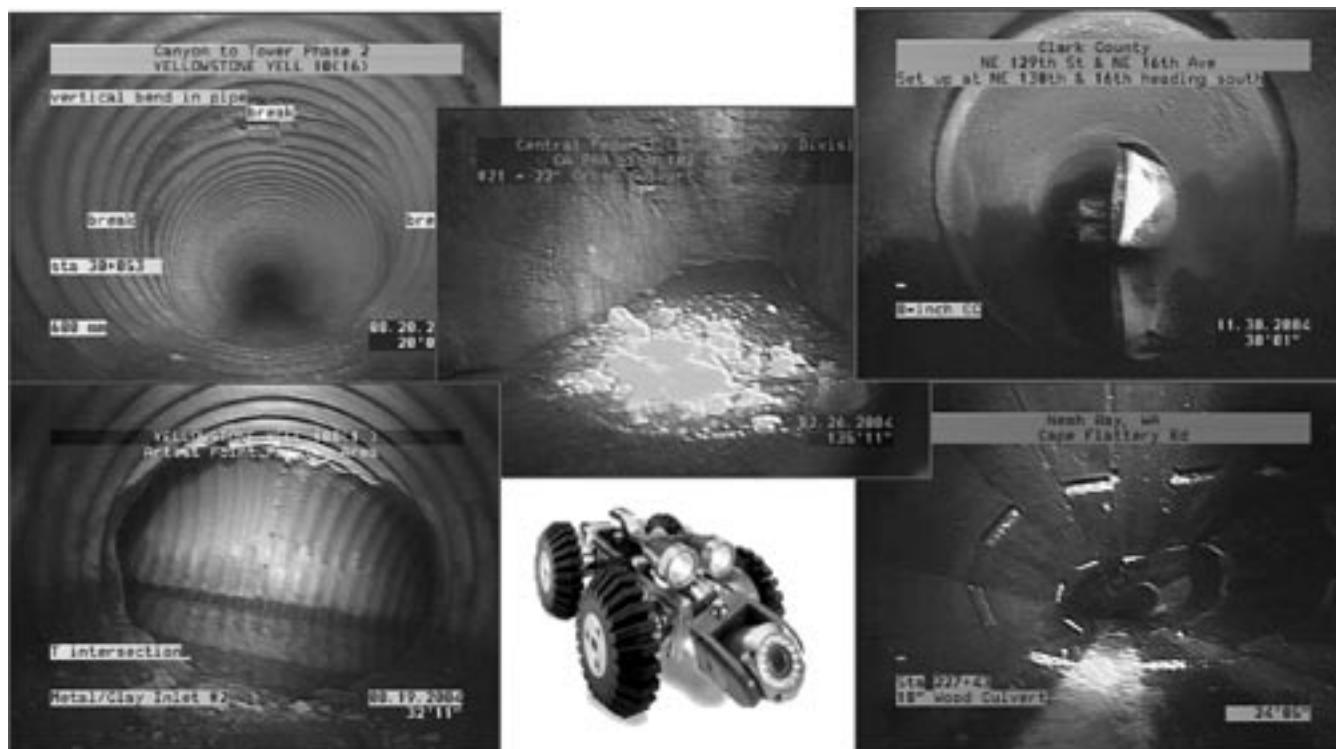
In this particular case, the use of the Rovver provided the Montana DOT design-staff the condition assessment of the 24-inch culvert and the precise location and number of collector pipes feeding into this culvert.

The Rovver Availability

The Rovver is available for use, free of charge, to any State, County, or City Transportation Department as part of the Technology Deployment Program of Western Federal Lands Highway Division in Vancouver, Washington. The Rovver can be requested through your local LTAP/TTAP center or directly through WFLHD (Amit Armstrong at (360) 619-7668).

Rovver Specifications

- **Depth Rating:** 1 bar (14.7 psi) — equivalent to water depth of 10 m (33 ft)
- **Temperature Rating:** 32°–150° Fahrenheit
- **Power Supply:** AC Inverter connection to inspection vehicle battery
- **Video Format:** MiniDV Tapes



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Cost-Effective Material for Bridge Bearings: Cotton Duck Bearing Pads

Cotton duck bearing pads are sometimes used to support loads and accommodate movement and rotations at bridge bearings. This research evaluated the use of cotton duck bearing pads for use in bridge construction including the variation in behavior with different bearing pad manufacturers. Cotton duck bearing pads, also referred to as fabric pads, are preformed, electromeric pads consisting of thin layers of elastomer interlayered with cotton duck fabric. They are an alternative to more expensive types of bearings where design parameters allow their use. They are manufactured under a military specification with limited guidance from AASHTO specifications.

The research developed design guidelines from a series of laboratory tests that evaluated the performance of the pads under various loading conditions. Pads were tested from three different manufacturers and some variation in performance was identified. Static tests, cyclic tests, and long duration compression tests

were performed as well as a large number of tests to evaluate the shear resistance of the pads. The report lists several conclusions that will help guide decisions on when cotton duck bearing pads can be appropriately used. Design recommendations were developed as well as a proposal for modification of the AASHTO Load and Resistance Factor Design (LRFD) Specifications. WSDOT is using cotton duck bearing pads and this new information will allow expanded use because of the added confidence provided by the results from this research.

How Can Local Agencies Use This Information

Local agency bridge designers may also benefit from this information and guidance in the use of cotton duck bearing pads for bridges on local routes. The limitations on compressive and shear strengths may be well within the design parameters for local roadway structures.

Technical Contact Information

For more information on this research or how it is being used by our Bridge and Structures Office, contact Ralph Dornsife at (360) 705-7199 or e-mail: dornsir@wsdot.wa.gov

The full report is available on the web at:
<http://depts.washington.edu/trac/bulkdisk/pdf/569.1.pdf>

Study Authors

The researchers at the University of Washington were Dawn Lehman and Charles W. Roeder. Ralph Dornsife, mentioned above, was the Technical Monitor from the WSDOT Bridge and Structures Office who advised on the technical aspects of the project. The project manager from the Research Office was Keith W. Anderson.



The *Gray Notebook* is a quarterly publication published by the Washington State Department of Transportation to track a variety of performance and accountability measures for review by the Transportation Commission

and others. The following is a sampling from this document. For an online version of this or a previous edition of the *Gray Notebook*, visit <http://www.wsdot.wa.gov/accountability/>



Washington State
Department of Transportation

Measures, Markers and Mileposts

The Gray Notebook for the quarter ending
September 30, 2004

WSDOT's quarterly report to the
Washington State Transportation Commission
on transportation programs and department management

Douglas B. MacDonald
Secretary of Transportation



Highway Construction Program

The Rising Cost of Construction Materials

Wrestling with the Issues

WSDOT, along with other states, has observed the rapid rise in steel prices, primarily due to an unprecedented demand for steel overseas. States have been wrestling with the issue of whether or not to include an “escalation clause” into construction contracts to help insulate or share the risk with the contractors. Similar concerns focus on cement shortages and price escalation, as well as increased prices for crude oil, which drives up the market price for fuel and asphalt.

The direct effect of steel, fuel and cement escalation on the cost of work is difficult to measure. WSDOT uses unit price contracting, where the contractor is requested to provide “bid prices” for completed items of work, as opposed to prices for individual components that make up a complete item of work. For instance, the contractor provides a complete price to furnish, install and test a storm sewer pipe. Integrated in this price, are all material cost, labor cost, equipment cost and any additional cost that may be associated with the risk of doing the work. It is generally not possible from the bid to isolate the cost of the pipe itself. However, all other things remaining constant, an increase in the cost of pipe would ultimately raise the price the contractor bids.

WSDOT collected data on select items that would serve a possible measure for the effect that price escalation has had on contracts. This was done under the assumption that “all other things remained constant”. In the end analysis, the items for “Steel Reinforcing Bar” and “Hot Mix Asphalt” revealed upward price trends that illustrate WSDOT’s concern with price escalations. A consistent trend for cement was not present. The trend of increased prices for steel reinforcing bars (rebar) and hot mix asphalt on WSDOT projects is similar to what is being reported on a national scale. Engineering News-Record (ENR) magazine tracks material price indexes for rebar and PG 58, the asphalt binder in Hot Mix Asphalt, in twenty cities around the country. The ENR price index is based on the material cost and does not include the other costs that are reflected in the WSDOT bid prices. To compare WSDOT and ENR trends, the ENR price indexes have been adjusted to a baseline that is equivalent to the WSDOT bid price for the first quarter of 2002.



Steel rebar used to build the Methow River Bridge deck.



Asphalt paving on I-90 at Moses Lake.

Highway Construction Program

Escalation Measure

Steel Reinforcing Bar Analysis Indicates a 100 Percent Increase

Steel is used in WSDOT projects primarily in two major areas – structural steel, and steel reinforcing bar. The design and construction of structures using structural steel is not the most common of WSDOT bridge materials, and therefore does not have a clear and consistent bid history in which to track escalation. Steel reinforcing bar (rebar) on the other hand is used in virtually all projects with structural work. The difficulty with rebar is that it is typically embedded in other lump sum items of work such as “superstructure”. A separate item is used for rebar that is placed in walls, footings and abutments. While this item may not accurately reflect the total quantity of rebar used in WSDOT projects and does include labor and equipment costs as well as materials, it should reflect the effects of cost escalation. Since January 2002 there seems to have been over a 100 percent increase in the price bid for steel reinforcing bar. During the same period the ENR rebar index increased by 36 percent.

Hot Mix Asphalt Analysis Indicates a 20 Percent Increase

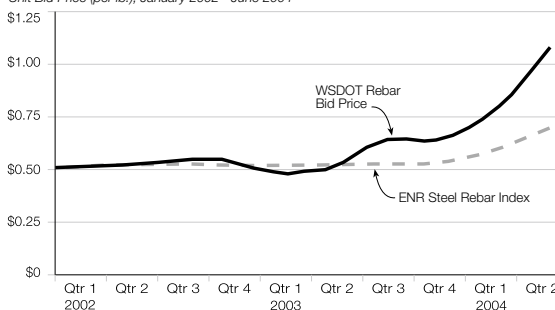
Hot Mix Asphalt prices were selected to help identify cost escalation in petroleum products. The unit cost of HMA involves the manufacturing, placement and compaction of asphalt pavement. The cost of this item is very dependent on the petroleum market, not only in the form of the liquid asphalt used in the mix, but also for the fuel cost of the plant, placement equipment, hauling vehicles and compaction train. Since January 2002 there has been a 20 percent increase in the price bid for Hot Mix Asphalt (36 percent since January 2000).

Continued Efforts to Track Cost Escalation

While it is difficult, if not impossible, to extrapolate data to predict the total cost impact from each of WSDOT's projects, it is clear from the highlighted trend that these items and perhaps others, are having an effect on bid prices. While this has not been a significant issue to date, WSDOT will continue to monitor the situation.

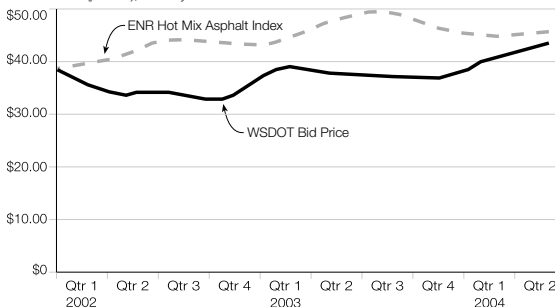
Steel Reinforcing Bar - Cost Trend

Unit Bid Price (per lb.), January 2002 - June 2004



Hot Mix Asphalt - Cost Trend

Unit Bid Price (per ton), January 2002 - June 2004



Environmental Programs: Quarterly Update

Riverbank Erosion

Case Study: The Hoh River on U.S. 101

The Northwest coast along U.S. 101 is known for its scenic beauty, but it also serves as a critical economic lifeline to the communities located in the most Northwestern part of the state. For over 20 years these communities and WSDOT have struggled with the Hoh River eroding portions of U.S. 101. The worst erosion site is located about 15 miles south of the town of Forks, on the east bank of the river.

Repeated attempts to stabilize the site under emergency conditions have failed to provide a long-term solution. This alarming trend has resulted in the site being identified as a top priority under WSDOT's Chronic Environmental Deficiencies Program (CEDP). The purpose of the program is to develop permanent solutions to repetitive erosion repair sites that compromise the integrity of the roadway and harm aquatic habitat.

Under the CEDP, a reach analysis was conducted for this site as well as five other repetitive erosion sites within the Hoh watershed where portions of U.S. 101 lie within the erosion hazard zone. The analysis determined that the erosion site at milepost 174 was the location at the greatest risk. A conceptual design, fundamentally different from previous bank protection strategies attempted at the site, was developed from the analysis. Instead of relying on rock to armor and deflect heavy flows away from the bank (a previous strategy), a series of ten engineered logjams was proposed, to split the flow of the river, diffuse higher energy flows while also deflecting erosive flows away from the bank. The engineered logjams reduce environmental mitigation costs, and provide fish habitat enhancements. Major flooding in October 2003 caused further damage at the site and opened up a funding opportunity using federal disaster recovery funds.

To take advantage of the relatively small window of opportunity to construct this project prior to the next flood event, a high level of collaboration between WSDOT staff, consultants, contractors, and regulatory agencies was needed. Construction on this project began during the summer of 2004 and was completed within a few short months. This is one of the largest engineered logjam projects ever undertaken by WSDOT for infrastructure protection purposes.

Project Costs

Over the last 20 years WSDOT has spent approximately \$2.2 million for repair work at this site.

One alternative considered was to realign U.S. 101. Estimated project costs were \$10.0 million and did not include mitigation costs for major environmental impacts.

Total project costs were approximately \$7 million. Eighty-seven percent of the project costs were paid by the Federal Highway Administration.



Before Construction -
Flooding at the Hoh
River erodes the
shoulder of U.S. 101



July 2004 -
Beginning of
Construction



August 30, 2004 -
Logjam construction
progress



September 28, 2004 -
Hoh River After
Construction

News from FHWA Washington Division

*By Liana Liu, P.E., Traffic/Safety/Research/T2 Engineer,
FHWA Washington Division*

2004 Transportation Planning Excellence Awards

The Transportation Planning Excellence Awards (TPEA) Program is a biennial awards program developed by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) to recognize outstanding initiatives across the country to develop, plan, and implement innovative transportation planning practices. The program is co-sponsored by the American Planning Association. 2004 is the first year of this biennial awards program.

In this first year of the program, over 220 nominations covering nine of the ten award categories were received. Eleven 2004 TPEA Awards and five Honorable Mentions were presented at ceremonies held on July 25 during the Joint Summer Meeting of the Transportation Research Board Committees in Park City, Utah, and the 38th Annual Conference of the National Association of Regional Councils in Chicago on June 28, respectively.

For a list of the 2004 TPEA List Award Winners, please visit the TPEA website at <http://www.fhwa.dot.gov/planning/tpea04/list.htm> or call the FHWA Office of Planning at (202) 366-0106 or the FTA Office of Planning and Environment at (202) 366-5653.

Please check the website for information about the 2006 Awards.

New GIS Use in Environmental Stream- lining and Stewardship Workshop (GIS4EST)

The FHWA Resource Center and the Office of Project Development and Environmental Review have developed a one-day workshop on the use of spatial data in facilitating environmental considerations in planning and project development. FHWA is looking for a Pilot State for the workshop. For more information, contact Ben Williams, FHWA Resource Center, at (404) 562-3671, or ben.williams@fhwa.dot.gov

Microsimulation User Guidelines

More MPOs and states are using microsimulation models to get another viewpoint on the impact of Congestion Management Systems and operational issues in planning. The FHWA Office of Operations recently has produced a primer on traffic analysis tools and user guidelines for their use. Please visit http://www.ops.fhwa.dot.gov/Travel/Traffic_Analysis_Tools/traffic_analysis_toolbox.htm

Transportation Demand Management

FHWA and the Association for Commuter Transportation have released an updated report on the role of travel demand management strategies on congestion. The report entitled "Mitigating Traffic Congestion: The Role of Demand-Side Strategies" can be found on the web at <http://tmi.cob.fsu.edu/act/>

Freight Advanced Commute Workshop

Having trouble figuring out how to get a freight study started? This interactive seminar examines the reasons and methods for performing freight studies within the transportation planning process. Its audience is small and medium sized MPOs. As background, three questions are addressed: what is freight transportation; why do we do freight studies; and why are we seeing all these trucks on the roads? In addition, growth of containerization, e-commerce, and freight impacts on traffic are reviewed. In a brainstorming setting, participants are invited to discuss their personal knowledge of freight movement through and within their communities to determine if there is a "freight problem," its magnitude and causes. Participants are encouraged to familiarize themselves beforehand with congested areas and times within their areas. Once a determination is made that there is a problem, a methodology is presented to determine the causes and possible remedies. Contact Robert Radics, FHWA Resource Center, (404) 562-3692 or robert.radics@fhwa.dot.gov

AICP Endorses NHI & NTI Planning Courses

The American Institute of Certified Planners (AICP) has endorsed seven National Highway Institute (NHI) and National Transit Institute (NTI) joint multi-modal planning courses for their Continuing Professional Development Program (CPDP). These courses are as follows:

- Metropolitan Transportation Planning
- Introduction to Statewide Transportation Planning
- Statewide and Metropolitan Transportation Programming
- Coordinating Transportation and Land Use
- Public Involvement in Transportation Decision Making
- Financial Planning
- Bus Rapid Transit

Certified Planners may receive Continuing Professional Development Program hours for taking these courses.

For more information about the American Institute of Certified Planners Continuing Professional Development Program, see <http://www.planning.org/cpdp/>

MOBILE6 Research Study

A recently completed FHWA research study on project-level impacts of the MOBILE6 model is now available. The CAL3QHC roadway intersection model is typically employed to determine potential air quality impacts for project-level analysis. The study is divided into three main components addressing the following three questions: (1) How will changes in MOBILE6 impact project-level results? (2) How will changes in MOBILE6 affect the process for project-level analysis? and (3) Will changes in MOBILE6 significantly impact screening assessment procedures? For study results, see: <http://www.fhwa.dot.gov/environment/conformity/mobile6/index.htm>

Modeling Tools

FHWA has recently released the DYNASMART-P software tool. DYNASMART-P was developed for traffic operations planning applications under the FHWA's Dynamic Traffic Assignment (DTA) research program. DYNASMART-P combines (1) dynamic network assignment models, used primarily in conjunction with demand forecasting procedures for planning applications, and (2) traffic simulation models, used primarily for traffic operations studies.

FHWA has also developed an input editor, DSPED, to assist users in preparing input data. DYNASMART-P and DSPED are available from the McTrans Center. For ordering information, please visit <http://mctrans.ce.ufl.edu/>



What is in Your Toolbox?

Video Surveillance, Pixel Recognition, and Data Automation

By Roger Chappell, Technology Integration Engineer, Washington State Department of Transportation Highways & Local Programs WST2 Center

Video surveillance and pixel recognition technology are simply data gathering, recording, and data automation tools. Designed and installed properly, these systems have proven to be cost effective, increase safety, and deliver consistent results with little human intervention. The key to a successful system is using the right tool for the right location. This article will cover some of the basics needed for the successful implementation of a Stationary Ground Base Imaging (SGBI) system.

I am finding that many agencies today are looking to video surveillance and pixel recognition technologies (SGBI) for many applications such as traffic signal activation, vehicle counts and classifications, traffic patterns, and traffic flow studies. Video surveillance is also used for non-intrusive image-capture of weaving patterns for merging vehicles, intersection and round-about performance, pedestrian studies, and conflict studies such as in school zones. With the right tools, one technician can perform many simultaneous data gathering samples with minimal exposure to roadway hazards. These types of studies require long periods of data observation and require a high degree of portability (moving from study section to study section). Capturing the raw



data in the field using imaging equipment and analyzing that data in the office later is the method of choice for many types of traffic studies. Unless the data quality or cost of automation is too prohibitive, I would rather bring the field data into the office, than bring the office out to the field.

Pixel recognition can be complex and require sophisticated equipment and trained technicians to build and maintain a system. These systems tend to be used for long-term studies or traffic flow automation such as signal activation or Intelligent Transportation Systems (ITS). In these systems, zones are identified and change is detected within the pixels of the zones. Before discussing the differences in portable versus permanent systems, I would like to focus on some of the commonalities they share.



In all systems, a camera represents a specific location. Some pixel recognition technologies allow you to “nest” multiple “zones of interest,” for each location or camera position. A good camera location starts with thorough evaluation of the site location. What you discover from your site evaluation will help to determine what tools are most suited for the job.

For example, if you need 24-hour continuous operation, you will need adequate illumination. Unless you are using infrared cameras, pixel recognition equipment cannot “see” dark on dark objects — you need contrast. The same problem occurs with light on light and gray on gray imaging. A dark vehicle in a shadowed zone may be even harder to detect than a dark vehicle at night due to the contrast provided by

the headlights at night. It is also difficult to distinguish a light-colored vehicle from a bright horizon or reflective wet pavement. The general rule of thumb for pixel recognition technology is: the higher the contrast between the object being studied and the background, the better.

For a permanent location, you will also need to know where the shadows fall throughout a 24-hour period and how the shadows move over the course of a year. You need to consider whether shadows from nearby buildings or vegetation obscure the zone during different seasons of the year. A reflection of light off the windows of a nearby office building or signage may be enough to force your camera's iris to shut down, causing a low contrast situation. There are polarizing filters, specialty cameras, and techniques that can help you compensate for these situations after installation, but it is better to avoid these situations if possible. If you are considering a permanent location for long-term monitoring or automation, then you may want to install temporary portable surveillance equipment to help aid in your site evaluation.

Another equally important matter to consider is known as "height to zone." The camera's location will need to provide enough coverage of your zone(s). This becomes particularly important when using pixel recognition technology. You should be thoroughly familiar with hardware manufacturer's installation recommendations when evaluating possible site locations. For example, the manufacturer's instructions may say that an average sized vehicle at the stop bar should be about the size of your thumb when viewed on a 9-inch monitor.

If you are planning to use features such as "advanced detection zones" or "nested zones," the size of objects interacting with these zones can be critical. Objects appear smaller as they approach the horizon at the top of the monitor screen. Objects farther away from the camera have fewer pixels. The farther away or smaller the detection zone, the harder it is to detect pixel change. Additionally, the more atmosphere between your camera and the detection zone, the greater chance that rain, snow, fog, brightness, and darkness will affect your detection efforts.

Most manufacturers recommend that the screen extend no further than the detection zone. If the sky above the horizon is included, the brightness of the sky will lower the contrast and close down your camera's aperture. Basically, you want a downward view from your camera, and the only area you should see in the monitor is the desired zone. When evaluating the location, just remember that your manufacturer may have very specific installation instructions stating the distance from the zone, height above the zone, and angle to the zone that must be accommodated in your final site plan.

Some other things to consider in your site reconnaissance include:

- **Power:** Is it available? What will it take to connect? Do you need to look at solar alternatives? Most of this type of equipment has 12-volt alternatives for use in portable and solar-powered applications.
- **Data Transfer:** Is someone going to retrieve the data manually or are you going to use a land-line or a cell phone?
- **Electrical Noise:** Are there microwave or cell towers, large power lines or industrial manufacturing such as welding shops in the immediate vicinity?
- **Mounting:** Complex inter-agency agreements may be required before a camera may be mounted on a pole, luminaire, bridge or structure.
- **Weather:** Heat, cold and humidity will need to be considered and controlled within the enclosure. If your area is prone to lightning strikes, additional grounding may be required.



Downward view through camera of study site.

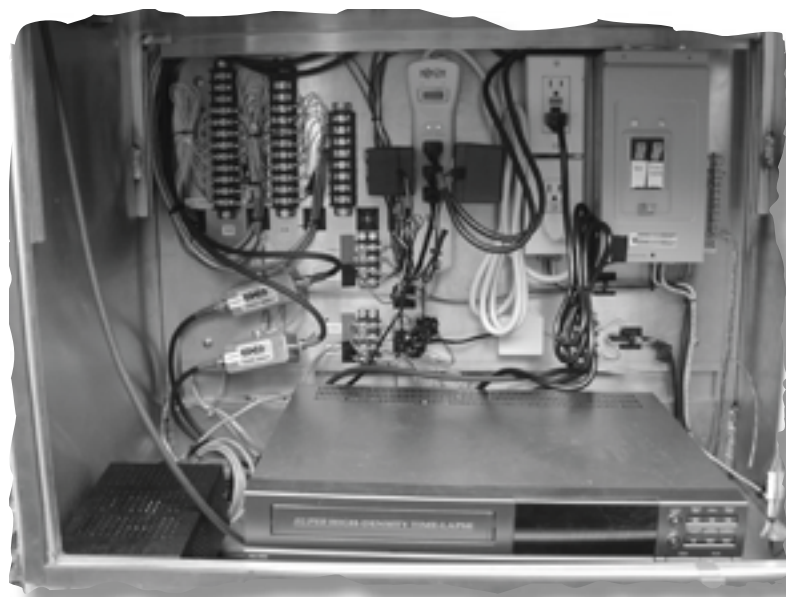
Types and configurations of equipment are numerous and are evolving. Cameras, recorders, peripherals, computers, monitors, telemetry devices are all components of an integrated system. Some pieces of equipment integrate better than others. Some components were designed to work indoors and sit on a desk, and they may have a much short life expectancy in a metal box next to a road.

When integrating a system, keeping things simple, modular, clean and labeled will contribute to the success of your project. Each location is unique and equipment will need to be customized for the location to achieve the optimal results. While there is no perfect site location, I have not yet seen

a site for which a system could not be engineered, but I have seen sites where the data quality was low and data cost was very high. In most of these cases, data quality could have been improved and overall costs reduced if a more rigorous site evaluation and a more thorough project plan had been employed.

Automated data capture is really what this technology is about. Whether you want to widen a roadway, construct a roundabout, or adjust flow throughput rates by optimizing signal timing, it all starts with data. The more data intensive the project, the more feasible data automation becomes. In the case of traffic signalization, it may be more cost effective to cut loops in some locations than it is

to use video detection. Keep your options open. Imaging technology is just one tool in the toolbox, and it is dependent upon a craftsman's ability to wield it properly to produce the desired results. If you are interested in literally playing with the latest developments in pixel recognition technology, check out "Eye Toy" compatible gaming software. Some weekend, visit your local video game store and rent a system for home use. By using a camera interfaced with the gaming console, you will experience in a gaming environment similar low/high contrast, noisy background and detection zone issues that are encountered in the field. The gaming world has made using pixel recognition technology fun. I believe it can also be used as a powerful tool if used properly.



This shows a clean installation, where system are labeled and color coded.

WST2 Resources

Free Publications from Your WST2 Center

For State of Washington residents only due to high mailing costs.

Name		Agency	
Mailing Address	City	State	Zip+4
Phone	Fax	E-mail	

Order direct from the WSDOT home page:

<http://www.wsdot.wa.gov/TA/T2Center/T2PUBS.htm>

Or you may fax the form to (360) 705-6858; or mail the form to WST2/WSDOT, H&LP, PO Box 47390, Olympia, WA 98504-7390; or e-mail your request to WST2Center@wsdot.wa.gov; or phone (360) 705-7386.

☒ Check the items you would like to order.

Hard Copy Publications

- ☐ Accessible Sidewalks and Street Crossings, FHWA, 2003
- ☐ Asset Management Primer, FHWA, 1999
- ☐ Concrete PASER Manual, University of Wisconsin, 1998
- ☐ Data Integration Primer, FHWA, 2001
- ☐ Designing Sidewalks and Trails for Access, Part 2, FHWA, 2001
- ☐ Dust Control on Low Volume Roads, FHWA, 2001
- ☐ Field Guide for Unpaved Rural Roads, Wyoming T2 Center, 1997
- ☐ Fish Passage Through Culverts, FHWA, USDA, 1998
- ☐ General Field Reference Guide (Pocket Size), 2002
- ☐ Geotextile Selection and Installation Manual for Rural Unpaved Roads, FHWA, 1989
- ☐ A Guide for Erecting Mailboxes on Highways, AASHTO, 1984
- ☐ HMA Pavement Smoothness, FHWA, 2002
- ☐ Improving Conditions for Bicycling and Walking, FHWA, 1998
- ☐ Improving Highway Safety at Bridges on Local Roads and Streets, FHWA, 1998
- ☐ Increasing Physical Activity Through Community Design, 2002
- ☐ Maintenance of Aggregate and Earth Roads, WST2 Center (1994 reprint)
- ☐ Pavement Preservation Checklist, FHWA, six pocket guides
- ☐ Pedestrian Safety for Older Adults, NHTSA
- ☐ Recommendations to Reduce Pedestrian Collisions, WSDOT, December 1999
- ☐ Reflective Sheeting Identification Guide, FHWA, 2001
- ☐ Roadway Safety Tolls for Local Agencies, NCHRP, Synthesis 321, TRB, 2003
- ☐ Scenic Byways Map of Washington State, 2003
- ☐ Traffic Control Handbook for Mobile Operations at Night, FHWA, 2003
- ☐ Trail Construction & Maintenance Notebook, USDA Forest Service, 2000
- ☐ Utility Cuts in Paved Roads, Field Guide, FHWA, 1997
- ☐ W-Beam Guardrail Repair and Maintenance, FHWA, 1996
- ☐ A Walkable Community is More Than Just Sidewalks, FHWA, 2000
- ☐ Washington Bicycle Map, WSDOT, 2001
- ☐ Wetland Trail Design and Construction, USDA, 2001
- ☐ Wildlife Habitat Connectivity Across European Highways, FHWA, 2002

Workbooks and Handouts from WST2 Center Workshops

- ☐ Application of Geographic Information Systems for Transportation, FHWA, 1999
- ☐ Construction Documentation: Construction Training Manual for Local Agencies, WSDOT, 2005
- ☐ Environmental Overview, LAG Manual Chapter 24, WSDOT, 2004

Videotapes

- ☐ Driving Modern Roundabouts, City of Lacey, City of Olympia, and WSDOT, 2002
- ☐ Pacific Northwest Transportation Technology Expo and Mousetraps

CD ROM

- ☐ H&LP CD Library (formerly WST2 CD Library), 6th Edition, Summer 2004 contains the following publications and many other technical documents:
 - Asphalt Pavement Repair Manuals of Practice, SHRP, 1993
 - Asphalt Seal Coats, WSDOT/WST2 Revised 2003
 - Building Projects that Build Communities, Community Partnership Forum, 2003
 - Concrete Pavement Repair Manuals of Practice, SHRP, 1993
 - Dust Palliative Selection and Application Guide, USFS, 1992

- Gravel Roads Maintenance and Design Manual, South Dakota LTAP, November 2000
- A Guide for Local Agency Pavement Managers, NWT2 Center, 1994
- Local Agency Pavement Management Application Guide, WST2 Center, 1997
- Local Agency Safety Management System, WSDOT, 1998, Reprinted 2000
- Maintenance of Signs & Sign Supports for Local Roads and Streets, FHWA, 2001
- Manual of Practice for an Effective Anti-icing Program: A Guide for Highway Winter Maintenance Personnel, FHWA, 1996
- Pavement Surface Condition Field Rating Manual for Asphalt Pavement, NWPMA, WSDOT, 1999
- Roundabouts: An Information Guide, FHWA, 2000
- Streetwise, A Simplified Local Agency Pavement Management System, WSDOT, 2000

Some of the publications on the CD Library are still available in hard copy within Washington State only. If you want hardcopy, please call (360) 705-7386 or e-mail schmidw@wsdot.wa.gov.

Other CDs

- Bicycle Safer Journey, FHWA, 2003
- Driving Modern Roundabouts, City of Lacey, City of Olympia and WSDOT, 2002
- Emergency Relief Training for Washington State Local Agencies, WSDOT, 2004
- Gravel Roads: Maintenance and Design Manual, FHWA, SD LTAP, 2000
- Pedestrian Facilities Guidebook, WSDOT, 1997
- Safer Journey, FHWA, 2003 (Pedestrian)
- WSDOT Engineering Publications CD Library, March 2004
- Work Zone Safety for Roadway Maintenance Operations, Interactive Training Course Advanced Technology Concepts with Rutgers University

DVD

- Danger Signs, 2004
- Driving Modern Roundabouts, City of Lacey, City of Olympia and WSDOT, 2002
- Pedestrian Safety, City of Olympia and Washington Traffic Safety Commission, 2004

Non-Credit Self-Study Guides

These non-credit WSDOT self-study guides may be obtained from the WST2 Center. An invoice will be sent with the books.

- Basic Surveying, \$20
- Advanced Surveying (metric), \$20
- Contract Plans Reading, \$25
- Technical Mathematics I, \$20
- Technical Mathematics II, \$20
- Basic Metric System, \$20

Online Resources

Bridge

- WSDOT Highways & Local Programs
<http://www.wsdot.wa.gov/TA/Operations/BRIDGE/BRIDGEHP.HTM>

Environmental

- *Environmental Procedures Manual* (M31-11)
<http://www.wsdot.wa.gov/fasc/EngineeringPublications/Manuals/EPM/EPM.htm>
- Regional Road Maintenance Endangered Species Act Program Guidelines
<http://www.metrokc.gov/roadcon/bmp/pdfguide.htm>
- National Marine Fisheries Service Species Listings & Info
<http://www.nwr.noaa.gov/>
- U.S. Fish and Wildlife Service Species Listings & Info
<http://endangered.fws.gov/>
- Washington State DNR's Natural Heritage Program Home Page
<http://www.wa.gov/dnr/htdocs/fr/nhp/refdesk/fsrefix.htm>
- FHWA's Environmental Home Page
<http://www.fhwa.dot.gov/environment/index.htm>

Highways & Local Programs List Servs

For the following list servs:

- WST2 Newsletter
- WST2 Training
- Traffic Technology and Safety

Use the following address to sign up:

<http://www.wsdot.wa.gov/TA/T2Center/T2hp.htm>

WSDOT Materials Lab

- <http://www.wsdot.wa.gov/biz/mats>

Infrastructure Management & GIS/GPS

The site below has been established to promote interagency data exchange and resources sharing between local governmental agencies.

<http://www.wsdot.wa.gov/TA/T2Center/Mgt.Systems/InfrastructureTechnology/InfThp.html>

Legal Search

- Search RCWs and WACs
<http://search.leg.wa.gov/pub/textsearch/default.asp>

Local Agency Guidelines (LAG) Manual

- <http://www.wsdot.wa.gov/TA/Operations/LAG/LAGHP.htm>

Pavement Management

- Pavement Publications & NWPMA Links
<http://www.wsdot.wa.gov/TA/T2Center/Mgt.Systems/PavementTechnology>
- NWPMA – North West Pavement Management Association
<http://www.wsdot.wa.gov/TA/T2Center/Mgt.Systems/PavementTechnology/nwpma.html>
- Asphalt Institute
<http://www.asphaltinstitute.org/>
- National Asphalt Pavement Association
<http://www.hotmix.org/>
- Pavement (A Website for Managing Pavements)
<http://www.mincad.com.au/pavenet>
- SuperPave Information
<http://www.utexas.edu/research/superpave>

Project Development

- Federal Aid Progress Billing Form
<http://www.wsdot.wa.gov/TA/ProgMgt/Projectinfo/BILLFORM.XLS>
- State Funded Progress Billing Form
<http://www.wsdot.wa.gov/TA/ProgMgt/Projectinfo/BILLFORMSTATE.xls>
- STIP (State Transportation Improvement Program)
<http://www.wsdot.wa.gov/TA/ProgMgt/STIP/STIPHP.htm>

- TIP (Local Agency 6-Year Transportation Improvement Program)
<http://www.wsdot.wa.gov/TA/ProgMgt/STIP/TIP.html>

Research

- WSDOT Research Office
<http://www.wsdot.wa.gov/research>
- Looking for a Transportation Research Publication?
<http://gulliver.trb.org>
- Municipal Research and Services Center of Washington
<http://www.mrsc.org>

Traffic & Safety

- Safety Management Publications & Information
<http://www.wsdot.wa.gov/TA/T2Center/Mgt.Systems/SafetyTechnology/>
- WSDOT Traffic Data Office
<http://www.wsdot.wa.gov/mapsdata/tdo/>
- Washington State Patrol
<http://www.wsp.wa.gov>
- Washington Traffic Safety Commission
<http://www.wtsc.wa.gov>
- National Highway Traffic Safety Administration
<http://www.nhtsa.dot.gov>
- American Traffic Safety Services Association
<http://www.atssa.com>
- Municipal Research and Services Center of Washington
<http://www.mrsc.org>
- Transportation Research Board
<http://gulliver.trb.org>

Training

- WST2 Classes
<http://www.wsdot.wa.gov/TA/T2Center/Training/>
- WST2 Class Registration
http://fmapps.wsdot.wa.gov/tbase_registration/
- County Road Administration Board
<http://www.crab.wa.gov/>
- American Public Works Association
<http://www.apwa.net/education>
- Transportation Partnership in Engineering Education Development (TRANSPED)
<http://www.engr.washington.edu/epp>

WSDOT Local Programs Engineers

- Eastern Region (Spokane)
Keith Martin, (509) 324-6080,
martink@wsdot.wa.gov
- Northwest Region (Seattle)
Ed Conyers, (206) 440-4734,
conyere@wsdot.wa.gov
- Olympic Region (Olympia)
Neal Campbell, (360) 357-2666,
campben@wsdot.wa.gov
- North Central Region (Wenatchee)
Paul Mahre, (509) 667-3090 or 667-2900,
mahrep@wsdot.wa.gov
- South Central Region (Yakima)
Roger Arms, (509) 577-1780,
armsr@wsdot.wa.gov
- Southwest Region (Vancouver)
Bill Pierce, (360) 905-2215,
pierceb@wsdot.wa.gov

Other Online Resources

- Bicycle maps and other information
<http://www.wsdot.wa.gov/bike/>
- Pedestrian information
<http://www.wsdot.wa.gov/walk/>
- Rural Partnerships and scenic byways information
<http://www.wsdot.wa.gov/TA/progmgt/byways/>
- Better Mousetraps
<http://www.wsdot.wa.gov/ta/T2Center/Mousetraps/>
- Retired Professional Program
<http://www.wsdot.wa.gov/TA/T2Center/Retired.htm>
- Student Referral Program
<http://www.wsdot.wa.gov/TA/T2Center/StudentReferral/>
- LTAP (Local Technical Assistance Program) Clearing House
<http://www.ltapt2.org>
- Institute of Transportation Engineers
<http://www.ite.org>
- Washington State Counties
<http://mrsc.org/byndmrsc/counties.aspx>
- Washington State Cities and Towns
<http://mrsc.org/byndmrsc/cities.aspx>
- Governor's Office of Indian Affairs
<http://www.goia.wa.gov>
- Southwest Interagency Coop - Grounds Equipment Maintenance (GEM)
<http://www.gematwork.org>

Washington State T2 Center

Contact: Laurel Gray (360) 705-7355
Wendy Schmidt (360) 705-7386
<http://www.wsdot.wa.gov/TA/T2Center/Training>

To register for a class in this section, use the contacts listed above.

The class fees shown apply to both public and private sector students. Online registrations are now being accepted for the following 2005 classes. Updated information on these courses, and the link to the online registration form, can be obtained from the web page listed above.

Construction Documentation

2005: February 15, Port Angeles; February 16, Tacoma; March 15, Bellevue; March 16, Kent; October 25, Spokane; December 13, Shoreline; December 14, Kent.

2006: January 10, Port Orchard; January 11, Tacoma; January 30, Vancouver; February 1, Olympia; February 14, Wenatchee; February 16, Kennewick; March 14, North Seattle; March 15, East Seattle.

Free. Instructor: Ken Hash, WSDOT SW Region Engineer. Regional Local Program Engineers will be in attendance at each class to answer questions. This course covers three project phases: pre-contract, contract, and post-contract documentation of public works projects with FHWA funding. Local agency and contractor's documentation is discussed, with a strong emphasis on the documentation requirements of the field inspector. On completion of this course, participants will have a working knowledge of: (1) required documentation that will be submitted by the contractor, (2) required documentation for acceptance of contract materials, (3) daily inspector's documentation of the contract work, and (4) source documentation for the monthly progress payment to the contractor.

Bridge Condition Inspection Update (BCIU)

February 15-16, Lacey. **Free.** Instructor: Grant Griffin, WSDOT Bridge Engineer. This course will provide information on the latest inspection manual, Laptop98 bridge inspection software, bridge file records, and other important bridge inspection issues. Sufficiency ratings and proper coding of bridge elements will also be discussed.

Bridge Condition Inspection Fundamentals (BCIF)

February 8-10, Lacey. **Free** to Washington State local agencies and consultants. All others \$150. Instructor: Grant Griffin, WSDOT Bridge Engineer. This course is designed to provide basic knowledge of bridge condition inspection, construction materials, material properties, bridge components and nomenclatures, loadings, stresses and strains, and deterioration of bridge materials and members. For engineering or design technicians and other personnel who have little or no background in bridges. This course is preparatory for BCIT.

Bridge Condition Inspection Training (BCIT)

March 14-25, Lacey. **Free** to Washington State local agencies and consultants. All others \$700. Instructor: Grant Griffin, WSDOT Bridge Engineer. This training is for new bridge inspectors or those who desire a refresher. It is based on the FHWA "Bridge Inspector's Reference Manual" and will provide extensive training on the condition inspection of in-service bridges. Two comprehensive examinations will be administered: a field exam covering inspection and inventory coding, and a multiple choice classroom exam. Satisfactory completion of this course will fulfill the training requirements of the National Bridge Inspection Standards (NBIS) for a "comprehensive training course" based on the reference manual.

Environmental Overview for Local Agencies

February 8, Tumwater. **Free.** Instructors: John Heinley, Trevin Taylor, and Brian Hasselbach, WSDOT Highways & Local Programs Environmental Staff. This course will give a basic understanding of the National Environmental Policy Act (NEPA) and other environmental procedures — what the requirements are, when they apply, and how to properly fill out the paperwork. Specific topics will include: the Endangered Species Act's Section 7 consultations — formal and informal; Memorandums of Agreement for Adverse Cultural/Historical Effects; the Section 106 process — including exemptions; Tribal Relations and Traditional Cultural Properties; Section 4(f) Evaluations; guidance on air quality, noise impacts, and environmental justice discipline reports; and a general discussion regarding the process and documentation requirements of Environmental Assessments and Environmental Impact Statements.

Context Sensitive Solutions

March 1-2, Yakima; March 30-31, Seattle. **Free.** Instructors: John Heinley and Kumari Bharil, WSDOT. This course will provide the knowledge and skills to collaboratively develop transportation projects

addressing the needs of a broad range of users and interested parties. Participants will learn to identify critical issues, involve stakeholders, evaluate alternatives and minimize tort liability when developing solutions to transportation issues that are specific to individual sites.

Implementing HMA (Superpave) in Local Agencies

March 2, Vancouver; March 8, Seattle; April 20, Kennewick; May 17, Wenatchee. **Free.** Instructors: Dave Erickson, WSDOT Construction Office; Joe Devol, WSDOT Materials Lab; Cathy Nicholas, FHWA. This training will offer local agencies an overview of the Superpave process, highlight changes to the *2004 Standard Specifications*, address materials and testing issues, and design and construction considerations from a local agency perspective.

Contract Specification Writing (LAG Program)

2005: April 13, Moses Lake; May 19, Tacoma; September 20, Everett; October 5, Kent; November 16, Port Orchard.

2006: April, Spokane; May, Vancouver; September, Seattle; October, Lacey; November, Mt. Vernon.

\$75. Instructor: Steve Boesel. This class will provide guidance and methods for writing consistently clear, concise, complete and well formatted contract special provisions. It will provide a thought process that can be used when writing or reviewing contract specifications to ensure the greatest possibility for a successful bid and a successful construction project.

Basics of a Good Gravel Road

April 19, Moses Lake. **\$45.** Instructor: Bill Heiden. This is a basic road maintenance class. All major problems of unpaved gravel roads will be addressed: washboarding (corrugation), traffic patterns, rutting, surface drainage, dust control, surface material, and roadside obstruction. The techniques that Mr. Heiden teaches can help to reduce unpaved road maintenance expenditures by up to 40 percent of current expenditures in three to five years.

Roadway Drainage

April 21, Yakima; April 26, Kent; April 28, Vancouver. **\$45.** Instructor: Bill Heiden. This course will discuss basic road design characteristics as it relates to drainage, soil, basic hydrology (drainage areas, runoff, rainfall intensity), hydraulics (culvert materials, sizing culverts and ditches), placement of culverts and end treatments, culvert and ditch maintenance. The course is intended to cover the needs of all people responsible for roads, from managers to operators. The course will not provide design criteria for engineers.

Cultural Resources

May 2-5, The Dalles, Oregon. **\$350.** This course is held twice yearly in May and October. This training will introduce participants to the value and significance of Washington's irreplaceable cultural resources. This class provides an exceptional opportunity for local agencies to work with the northwest's most qualified instructors, visiting some of the area's finest examples of cultural resources and attending the only statewide training session of this caliber. There will be presentations by native Americans on their cultural perspective; speakers on state archaeology, prehistory of Washington, Native American ethnobotany, prehistoric stone artifacts, rare plants, logging in the northwest, federal and state cultural resource regulations and how it applies to your agency. There will be in-field lessons on learning how to "read" the landscape and recognize the probable cultural resources located at the site, and a sharing of preservation techniques and strategies. For any individual who wants to become knowledgeable about cultural resources and possess the necessary skills to address basic resource management problems associated with cultural resources. Call the T2 office to have your name placed on a wait list for the next class; this course is not available for online registration.

Superpave Academy

May 2-5, May 23-26, Wenatchee. **\$300.** Instructors: Tim Moomaw and Mike Dellinger, WSDOT Region Trainers. Class will be at the Materials Lab in Wenatchee. The academy is designed for the transportation technician or engineer who is interested in attaining knowledge of Superpave mix design, testing of hot mix asphalt and aggregate properties. The course will provide the necessary knowledge to become a qualified tester in the required test methods. Participants will acquire knowledge and skills in the following areas:

1. Terms and acronyms associated with Superpave volumetric properties
2. Superpave mix design process and aggregate stockpile blending ratio
3. Plotting and interpretation of the FHWA 0.45 power gradation chart
4. Introduction to test methods for acceptance of Hot Mix Asphalt
5. Demonstration and hands on of Superpave gyratory compactor
6. Standardization of forms for use in volumetric calculations
7. Evaluation of volumetric properties

Modern Chip Seal Techniques

May 3, Moses Lake; May 4, Tacoma; May 5, Vancouver. **\$50.** Instructor: Phil Barto, P.E., retired Spokane Co. Operations Engineer. This course will cover: Asphalt chemistry, the purpose of chip sealing, asphalt and aggregates for chip sealing, design, supervising the chip seal crews, equipment preparation, calibration and maintenance, constructing a chip seal, weather conditions, and cost management.

Purchasing, Bidding and Contract Management for Local Agencies

Four sessions will be offered in 2005. May 5, Spokane; September 14, Mt. Vernon; October 4, Yakima; November 16, Tacoma. **\$75.** Instructors: John Carpita, Municipal Research & Services Center of Washington; Nancy Woods, City of Lynnwood Purchasing Manager; and Dick Andrews, Perteet, Inc. Topics to be discussed:

- Purchasing and bidding overview — statutes that affect local agencies in purchasing goods, materials and services.
- Procurement issues, policies, and procedures.
- Public works contracting — procedures, checklists, files; contract documents; bidding and contract award issues; contract administration and closeout; retainage and bonding; sales and use tax issues; exemptions; small works projects; emergency contracts; prevailing wage issues; contractor licensing, bond and insurance requirements.
- Consultant selection — types of consultants; quality-based selection vs. bids; selection process; contract negotiations.

Pavement Condition Rating

May 10-11, Ellensburg; May 24-25, Tacoma; September 13-14, Tacoma. **Free.** Instructor: Bob Brooks, WST2 Pavement Engineer. Participants will learn to rate any of the pavements commonly found in Washington. The rating values obtained using the definitions and methods learned in this course should compare favorably with those obtained and used in the Washington State Pavement Management System. Each participant should be able to perform a pavement condition survey with reasonable objectivity.

Designing Accessible Pedestrian Facilities

June 7-8, Tacoma. **\$100.** Instructor: Ida van Schalkwyk, University of Arizona. The provision of accessible pedestrian facilities is mandated by the Federal Americans with Disabilities Act. This course provides a solid background on many aspects of the Americans with Disabilities Act and its interpretation by the Access Board and the courts. The course covers the

characteristics of pedestrians, people with disabilities, legal requirements, policies and funding opportunities and focuses on accessible pedestrian design.

Introduction to GPS Mapping Grade Equipment

\$325. This is a three-day, special-request class. Sessions can be scheduled in the WSDOT Tumwater training room, or scheduled in your agency. Fee is based on 4 students per session. Instructor: Max Schade. This is an introductory course on mapping grade GPS equipment and is taught by a Trimble-certified instructor. It is designed to provide basic knowledge and skills in the use of GPS technology in mission planning, data gathering, and data processing. The training will enable field operation personnel to use new methods and Trimble mapping grade equipment as well as understand problems encountered when using the GPS satellite constellation.

WSDOT Construction and Design Courses

Selected courses have been opened to local agencies in the Design and Construction disciplines. All classes are free.

- Roadside Safety (B74)
- Managing Project Delivery (B71)
- WSDOT Interchange Design (CFU)
- Intersection and Pedestrian Design (CBD)
- Roadway Geometric Design (BWE)
- Excavation and Embankments Inspection (AC3)
- Nuclear Gauge Safety and Operation (ALG)
- Nuclear Gauge, Embankment/Surfacing/Pavement Applications (ANQ)
- Electrical-Illumination and Signals (API)
- Drainage Inspection (ACF)
- Hot Mix Asphalt Placement (ACB)
- Bridge and Structures Inspection 201 (CQ9)
- Bituminous Surface Treatment Inspection (ACC)

Each of these courses have sessions during the spring training season in Seattle, Olympia, Vancouver, Wenatchee, Yakima, and Spokane. Local agencies are given 20 percent of the seats in each of the classes. If you are interested in any of these courses, check the WST2 website for updates on availability. Numbers change often, people cancel registrations, new classes are added. It is best to check back often for updates. A link to all course descriptions can be found at the website.

Endangered Species Act 4(d) Training Program

ESA Training Tracks

The training program has three separate tracks; Track 1 is not part of the required training program.

- **Track 1: Briefing for Regional Decision Makers**
2 hours. No fee. An overview of the ESA program for regional level management and administration. This is a stand-alone training class and not part of the required training program. It is offered by members of the Regional Road Maintenance Forum. Call Roy Harris or Gerry Crum, City of Everett, at (425) 257-8800 for information. Information may also be obtained from Janine Johanson, METROKOC, at (206) 205-7101.
- **Track 2: Introduction, Design and BMPs, Monitoring, and Environmental Roles for Technical and Scientific Staff**
1.4 CEUs. Tuition is \$225. This two-day course is an overview of the procedures for technical, professional and environmental staff, supervisors and leads involved in maintenance activities. This track provides an introduction to the program Guidelines, design, habitat, the ten program elements and maintenance BMPs to meet ESA requirements.
- **Track 3: Classroom Introduction to ESA and Outcome-based Road Maintenance for Field Crews**
0.7 CEUs. Tuition is \$160. This one-day course is an overview of the procedures for field crews and leads involved in maintenance activities. This track provides an introduction to the program Guidelines, design, habitat, environmental roles, the ten program elements and implementation of maintenance BMPs to meet ESA requirements.

- **Track 3B: Field BMP Training for Bridges Consistent with NPDES**
0.7 CEUs. Tuition is \$125 Local Agencies, \$175 WSDOT. This one-day course is a field demonstration and applications course to train local and state bridge maintenance personnel on the proper use and application of approved materials and BMPs during the routine maintenance activities associated with the cleaning and painting of roadway bridges that pass over or near rivers, streams, and other waterways. This work will conform to NPDES and ESA.
- **Track 3F: Classroom Introduction to ESA and Outcome-based Road Maintenance for Field Crews and Crew Training in the Field Environment: Applying Maintenance BMPs**
0.7 CEUs. Tuition is \$125 Local Agencies, \$175 WSDOT. This one-day course is an overview of the procedures for field crews and leads involved in maintenance activities. This track provides an introduction to the program Guidelines, habitat, and is conducted in a field setting where teams of maintenance crews construct, test, and assess the effectiveness of a variety of BMPs. Participants will also learn how to monitor each BMP and measure its outcome in comparison to the outcome goals established in the approved program.
- **Track 4: Train-the Trainer for the Regional Road Maintenance Program**
1.4 CEUs. Tuition is \$240. For agency-selected ESA trainers. This two-day course focuses on training skills and techniques, and evaluates, prepares, and certifies candidates to teach the Regional Road Maintenance Program classroom training (Tracks 2 and 3).

TRANSPEED

University of Washington

Contact: Christy Pack
(206) 543-5539, toll free 1-866-791-1275
fax (206) 543-2352
<http://www.engr.washington.edu/epp>

To register for a class in this section, use the contact listed above.

The prices in this section are for local agency /non-local agency.

Managing Environmental Impact for Design and Construction

February 16-17, Seattle. \$385/\$600

Rehabilitation of Pavements

February 23-25, Lacey. \$320/\$520

Construction Inspection of Public Works Projects

February 28-March 1, Seattle. \$370/\$520

Administering Consultant Contracts

March 1, Seattle. \$175/\$320

Public Works Construction Project Management

March 3-4, Seattle. \$370/\$520

Basic Highway Capacity for Engineers and Planners

March 7-9, Seattle. \$320/\$520

Fundamentals of Traffic Engineering

March 14-16, Seattle. \$355/\$555

Legal Liability for Transportation Professionals

March 17-18, Seattle. \$270/\$450

Managing Environmental Impact for Design and Construction

March 26-27, Lacey. \$385/\$600

Storm Water Engineering for Transportation Professionals

March 30-April 1, Seattle. \$320/\$520

Managing Consultants

April 6, Lacey. \$485/\$650

Technical Communication for Transportation Professionals

April 11-12, Lacey. \$300/\$500

Determining Contract Working Days

April 19, Seattle. \$275/\$375

Bridge Foundation Design

April 26-28, Lacey. \$320/\$520

Work Zone Traffic Control Plan (TCP) Design

May 3-5, Lacey. \$370/\$570

Traffic Engineering Operations

May 9-11, Seattle. \$320/\$520

Traffic Signal Timing

May 16-17, Seattle. \$300/\$500

Urban Street Design

June 1-3, Lacey. \$320/\$520

Measuring Project Performance

June 2, Seattle. \$555/\$750

Traffic Calming: Techniques and Management

June 6-8, Seattle. \$370/\$550

Administering Consultant Contracts

June 14, Vancouver. \$175/\$320

Manual on Uniform Traffic Control Devices

June 15-17, Lacey. \$320/\$520

Associated General Contractors Education Foundation

Contact Beth Sachse
(206) 284-4500, fax (206) 284-4595
bsachse@agcwa.com
<http://www.constructionfoundation.org>

To register for a class in this section, use the contact listed above.

Construction Site Erosion and Sediment Control Certification

These WSDOT approved classes are presented by the AGC Education Foundation and available on the following dates:

February 18, Tacoma; March 29, Everett; April 29, Seattle; May 27, Tacoma; June 28, Seattle. Certification and recertification. \$225/\$250.

Other Training Programs for Local Agencies

Engineering Professional Programs (EPP)

University of Washington
(206) 543-5539
Engineering Refresher Courses
<http://www.engr.washington.edu/epp>

Professional Engineering Practice Liaison (PEPL)

University of Washington
(206) 543-5539
<http://www.engr.washington.edu/epp>

Washington Environmental Training Center

Green River Community College, Auburn
1-800-562-0858
<http://www.greenriver.edu/wetrc>

Click, Listen and Learn

American Public Works Association
(816) 472-6100
<http://www.apwa.net/education/cll/>

Washington State Emergency Management Division

(253) 512-7048 or (253) 512-7000
<http://emd.wa.gov/>

Washington State Department of Personnel (DOP)

Human Resource Development Services
(360) 664-1921
<http://hr.dop.wa.gov/training>

Evergreen Safety Council

(206) 382-4090 or 1-800-521-0778
<http://www.esc.org>

AASHTO Roadside Design Guide, Web-based Training

NHI Course Number: 380032C

This web-based course is approximately 14 hours long and is available anytime — 24 hours, 365 days a year via the Internet. The cost for non-FHWA employees is \$230 per participant and includes a copy of the 2002 AASHTO "Roadside Design Guide." This course provides an overview of the 2002 AASHTO "Roadside Design Guide." Emphasis is on current highway agency policies and practices. Participants must register online at <http://www.nhi.fhwa.dot.gov/registerdl.asp>

Computer Requirements: You will need a fairly recent version of a browser (such as Internet Explorer 4 or 5 or Netscape 4 with JavaScript enabled), the latest version of Macromedia Shockwave and Flash (which you can download from the Internet), and a connection to the Internet (at least 56K modem). An older computer such as a Pentium 100 would work, but it would be slower than a Pentium III. For more information, visit <http://www.nhi.fhwa.dot.gov>

Conferences

Road Builders' Clinic

March 1-3, 2005, Coeur d'Alene Resort, Coeur d'Alene, Idaho. Concrete Pavement Preconference Workshop will be held February 28-March 1. For information contact Washington State University at 1-800-942-4978.

Northwest Pavement Management Association (NWPMA) Conference

Spring: March 15-17, 2005, Spokane.
Fall: October 17-20, 2005, Vancouver.
For further information contact Bob Brooks at (360) 705-7352 or BrookBo@wsdot.wa.gov.

APWA Conferences

Spring: April 12-15, 2005. Tacoma Convention Center.
Contact Person: Tina Nelson at (253) 591-5787.

Fall: October 4-7, 2005. Yakima Convention Center.
Contact Person: Wendy Leinan at (509) 575-6068 or Dick McKinley at (360) 676-6961 for information about either conference.

Road and Street Maintenance Supervisors' Conference

East: October 4-6, 2005, Spokane
West: December 6-8, 2005, Bellevue
For information contact Michelle Johnson, Washington State University, at mlj@wsu.edu.

Safety Conference

September 2005. Date and location to be determined.

FHWA Calendar of Events

■ March 8-10, 2005

Highway Performance Monitoring System (HPMS) Data Collection Workshop
Salt Lake City, Utah
Contact Ralph Volpe, FHWA, at (202) 366-4048 or ralph.volpe@fhwa.dot.gov
<http://www.fhwa.dot.gov/policy/ohpi/hpms/hpmsworkshop.htm>

■ March 16-18, 2005

National Bike Summit
Washington, DC
Contact League of American Bicyclists at (202) 822-1333 or bikeleague@bikeleague.org

■ March 19-23, 2005

American Planning Association Annual National Planning Conference
San Francisco, California
(312) 786-6397 or conference@planning.org

■ April 3-6, 2005

AASHTO Geospatial Information for Transportation Symposium
Lincoln, Nebraska
For more information, contact Ben Williams, FHWA Resource Center at (404) 562-3671 or Ben.Williams@fhwa.dot.gov
You may also contact Mark Sarmiento, FHWA, at (202) 366-4828 or Mark.Sarmiento@fhwa.dot.gov
Visit: www.gis-t.org

■ May 15-17, 2005

2005 Transportation Management Association Summit
Radisson Plaza Hotel, Minneapolis, Minnesota
See ACT at <http://tmi.cob.fsu.edu/act/>



What's wrong with this picture? Thanks go to Leroy Dougall from the City of Blaine, Washington, for the picture.

One of the goals of the H&LP WST2 newsletter is to be an electronic publication. You can receive the newsletter electronically by adding your e-mail address to the WST2 Newsletter Listserv at <http://www.wsdot.wa.gov/TA/T2Center/T2HP.htm>. You can also view the newsletters at the same web address beneath the heading "Publications & Software".

If you would like to stop receiving a hardcopy of the newsletter, please e-mail Wendy Schmidt at schmidw@wsdot.wa.gov, and ask to be taken off the hardcopy mailing list.



Sign of the Times

Do you have a humorous traffic sign to share? Send us a print or e-mail a digital image (preferably a 300 dpi, 1000x1500 dpi jpeg or tif) and we will add it to our collection for publishing. Please provide your name, title, agency or company, and a short description of where and when you saw the sign. We want to give you credit for your participation.

You can e-mail the image to schofil@wsdot.wa.gov

Or mail the photo to:
"Sign of the Times"
WST2 Center
PO Box 47390
Olympia, WA 98504-7390

Please don't send your original photo. Although we will do our best to return the photo, we can't guarantee it.

Mousetrap Registration

Name of Invention: _____

Agency: _____ (WSDOT) Region: _____

Mailing Address: _____

City: _____ State _____ Zip+4: _____

Contact Person: _____

E-mail Address: _____

Phone: () _____ Fax: () _____

Inventor(s)/Fabricator(s): _____

E-mail Address: _____

Phone: () _____ Fax: () _____

Supervisor's Name: _____

What prompted this invention (or equipment modification)?

How was it developed?

Labor, Equipment, Materials Used (from scrap pile? Did you purchase any parts?):

Cost Estimate (a rough guess will do):

Benefits to your operations:

Include sketches or plans of your "Better Mousetrap" with dimensions and materials identified, and photographs of the item from all angles (front, top, side, etc.) with the inventors in the photo if possible, to:

Build a Better Mousetrap
WSDOT-WST2 Center
PO Box 47390
Olympia, WA 98504-7390

For more information and photos of Mousetraps and Expo, check the Washington State T2 Center's web page:
www.wsdot.wa.gov/TA/T2Center/t2hp.htm
or contact Wendy Schmidt at (360) 705-7386 for details.

You can now register your Mousetrap online at: <http://fmapps.wsdot.wa.gov/mousetraps/Register.htm>



Washington State Technology Transfer Center

WSDOT – H&LP Division

PO Box 47390

Olympia, WA 98504-7390

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